

## APPENDICITIS

A STUDY OF 5,067 CASES IN THE SURGICAL PROFESSORIAL UNIT,  
GENERAL HOSPITAL, SINGAPORE.

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There is no doubt at all that appendicitis is the commonest surgical emergency seen in the Surgical Professorial Unit, General Hospital, Singapore. The evidence to substantiate this statement and to indicate a steady yearly increase will be shown later on in this study. It was decided to review five thousand cases treated in the Unit. Although a much larger series could have been collected by going back further through the years, this would not have revealed more information for the purpose of this study. The cases studied were a total of five thousand and sixty-seven cases admitted and operated on between 1st July, 1954 and 30th June, 1961. The cases seen and treated conservatively for doubtful appendicitis or appendix mass in the corresponding period are not dealt with as these formed too small a number to justify inclusion. The cases who had appendicectomy in addition to other diseases, e.g. Meckel's diverticulitis, are also not included. In addition, those cases which were diagnosed as appendicitis, but other pathological conditions, e.g. perforated peptic ulcer, found at operation, are not considered.

The purpose of this study is to consider the age groups of our patients suffering from appendicitis, the sex distribution, the racial incidence, the types of appendicitis encountered in the Unit, the surgical treatment rendered and the mortality rate involved.

No attempt is made to go into the symptomatology and the clinical picture of appendicitis as these are so well described in the surgical textbooks widely read by medical students and other students of surgery.<sup>1, 2, 3.</sup>

It is inevitable that in a study of this character based on the accumulated records an accurate estimate of the possible anatomical positions of the appendix will not be available; however, 47% of the four thousand two hundred and eighty-three cases of acute appendicitis or kinked appendices were definitely classed as retrocaecal. This anatomical exercise was expertly dealt with by Gladstone and Wakeley in their analysis of three thousand cases. Similarly, although faecoliths were mentioned in 10% of the acute cases in our records, this figure may not be accurate. What

percentage of our cases had appendicitis because of trauma or obstruction by faecoliths is therefore not easy to say. Short (1920<sup>5</sup>) states that concretions are present in 15% to 20% of cases of appendicitis.

The appendix is on the average 7.5 cm. in length and ends blindly. It has a lumen which is scarcely larger than the capital letter O of this print. Two-thirds of the wall of the appendix is composed of mucosa and submucosa. Its submucosa has a large amount of lymphoid tissue so that the term "abdominal tonsil" is sometimes used to justify its relatively frequent susceptibility to inflammatory processes. This, on top of a somewhat poor blood supply and the possibility of kinking due to its length or its retrocaecal position, puts the appendix, in spite of its small size and apparent unimportance, on the surgical map as a structure not to be ignored.

## INCIDENCE

The Surgical Professorial Unit is on a full 24-hour duty for general surgical emergency every other day throughout the year, and thus is on active emergency duty for one hundred and eighty-two or one hundred and eighty-three days in the year. During the period under study, i.e. from 1st July, 1954 to 30th June, 1961, eight thousand and fifty-nine major surgical emergency cases were dealt with. The definition of a major surgical emergency is confined to a case where surgery is intracranial, intrathoracic or intraperitoneal. Of these eight thousand and fifty-nine operations, five thousand and sixty-seven were carried out for appendicitis, i.e. 62.9%.

Seasonal factors may be of some importance in the temperate countries in appendicitis, but are, however, not obviously so in the State of Singapore where the temperature is evenly tropical throughout the year. This is shown on Figure 1.

As stated before, there is an increase in the incidence of appendicitis over the years and this is associated with a corresponding increase in the surgical emergency cases. These apparent increases are shown on Figure 2 which shows the number of cases of appendicitis and emergency operated on in the Unit for the full years of 1955 to 1960 inclusive.

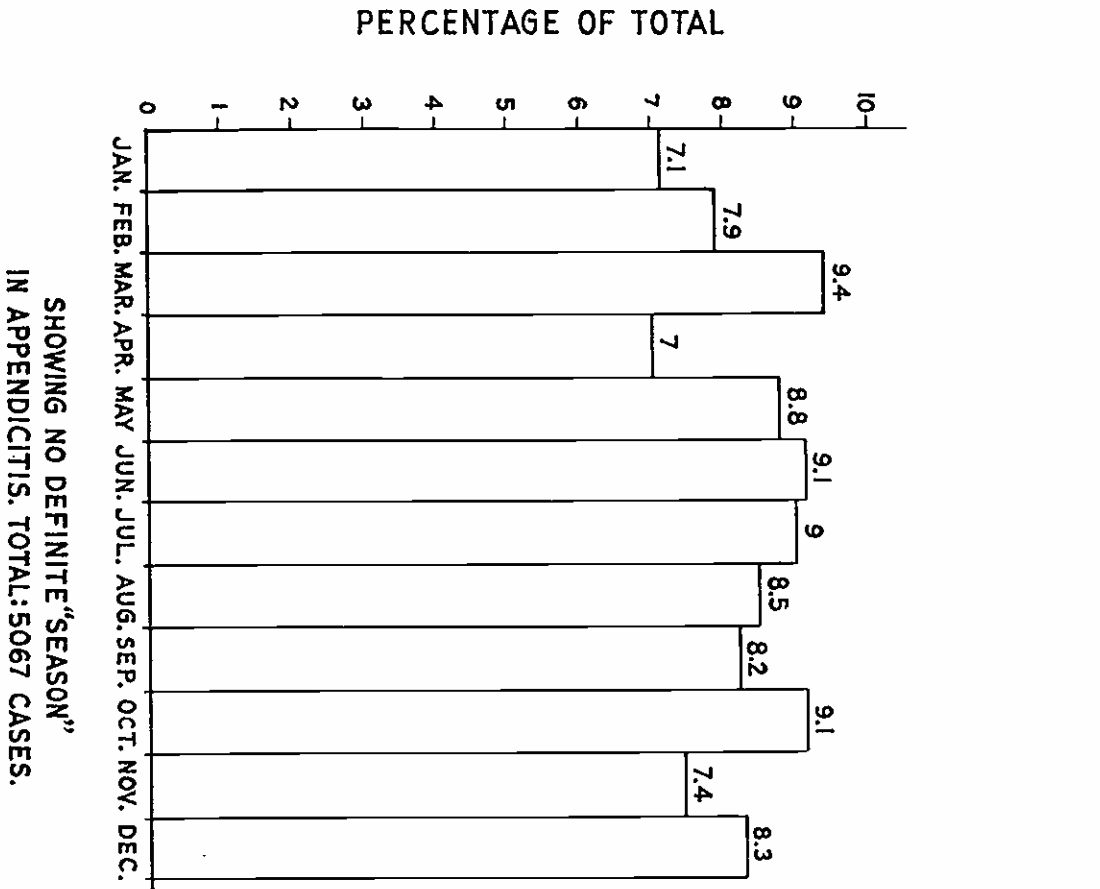


Figure 1.



Figure 2.

TABLE I

5,067 cases.

Age groups among the sexes.

Sex	AGE GROUPS																
	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	81-85
Males	73	327	313	472	537	478	330	249	160	149	81	47	14	8	4	2	1
Females	32	165	224	418	325	192	152	100	59	56	32	30	24	6	5	2	0

**SEX**

Males are more affected than females in this series. There were three thousand two hundred and forty-five males to one thousand eight hundred and twenty-two females giving a ratio of 1.7 M: 1 F.

**AGE**

In this series there is no doubt at all that appendicitis affects all age groups. The youngest in our series was a male, aged two and the oldest was also a male and he was eighty-three years of age. The concentration of appendicitis is found between the ages of six to forty with the peak at between the ages of sixteen and twenty-five. This is shown on Table I.

**RACIAL INCIDENCE**

As the Chinese section of the population of the State of Singapore forms the bulk of the population, it is not surprising that three thousand five hundred and ninety-four of the cases were Chinese, i.e. 70.9% (Table II).

**TABLE II SHOWS THE RACIAL DISTRIBUTION OF THE 5,067 CASES.**

	No.	%
Chinese	3,594	70.9
Indians	776	15.3
Malays	274	5.4
Eurasians	105	2.1
British	173	3.4
Europeans	85	1.7
Japanese	24	0.9
Jews	14	
Filipinos	7	
Americans	5	
Gurkhas	3	
Thais	2	
Koreans	2	
Borneans	1	
Algerians	1	
Argentiniens	1	

**CONDITIONS OF THE APPENDIX AT OPERATION**

Of the five thousand and sixty-seven cases of appendicitis, most of them, i.e. four thousand and seventy-six cases, were recorded as being in the acutely inflamed state. The rest were either perforated or had kinks due to adhesions. Table III shows this distribution.

**TABLE III  
5,067 CASES. CONDITION OF THE APPENDIX AT OPERATION.**

Condition		No. of cases	%
Acute appendicitis		4,076	80.4
Perforated:	With obvious peritonitis	525	10.4
	Abscess	166	3.3
	Gangrene	93	1.8
Kinked appendix		207	4.1

**TREATMENT**

The usual approach to the appendix is through a muscle-splitting gridiron incision as described by McBurney in 1894. This incision is preferred as the approach is directly over the appendix either for its removal or for the drainage of an abscess. This time-tested incision can be extended if necessary by a muscle-cutting procedure and was advocated also by Wakeley and Childs (1950<sup>6</sup>). Moloney et al (1950<sup>7</sup>) also prefer this incision as they maintain it involves less intra-peritoneal handling and disturbance, and any subsequent adhesions are usually only between the caecum and parietal peritoneum. Every attempt is made to remove the appendix in the case of an appendix mass, and, of the one hundred and sixty-six cases of appendix abscess treated, only sixty-six (or 39.8%) were treated by simple drainage. In the case of perforated appendicitis with or without peritonitis, the peritoneal cavity is drained through the gridiron incision after appendectomy. The stump in every case of appendectomy is inverted with a pure string suture after tying and division.

It is not the intention in this study to deal with the morbidity rate arising from our operative procedures. This may form another interesting study subsequently. Our non-perforated appendices, after appendectomy, only stayed in the hospital on the average four days whereas the

TABLE V

No.	Race	Sex	Age	Duration of symptoms (Days)	Acute appendicitis	Appendix abscess	Perforated with peritonitis	Treatment	Post-operative life (Days)	Necropsy findings
1	Malay	M	23	1			Yes	Drainage	1 day	Necropsy not done
2	Chinese	M	59	3			Yes	Drainage	1 day	Necropsy not done
3	Chinese	M	51	4			Yes	Drainage	1 day	Necropsy not done
4	Malay	M	37	4			Yes	Drainage	1 day	Necropsy not done
5	Chinese	M	8	3			Yes	Appendicectomy & drainage	1 day	Necropsy not done
6	Chinese	M	56	11			Yes	Appendicectomy & drainage	1 day	Multiple liver abscesses Appendix abscess Generalised peritonitis
7	Indian	M	8	3			Yes	Appendicectomy & drainage	1 day	Necropsy not done
8	Chinese	M	47	7		Yes		Drainage	7 days	Generalised peritonitis
9	Chinese	M	8	1			Yes	Drainage	1 day	Necropsy not done
10	Chinese	F	66	2		Yes		Drainage	5 days	Hypostatic pneumonia
11	Indian	M	38	1			Yes	Appendicectomy & drainage	14 days	Portal pylephlebitis
12	Chinese	F	6	4			Yes	Drainage	1 day	Necropsy not done
13	Chinese	M	14	5			Yes	Appendicectomy & drainage	2 days	Necropsy not done
14	Chinese	M	10	2			Yes	Appendicectomy & drainage	2 days	Necropsy not done
15	Indian	M	26	1	Yes			Appendicectomy & re-exploration	1 day	Haemorrhage mesoappendix
16	Indian	M	61	1	Yes			Appendicectomy	15 days	Necropsy not done
17	Chinese	F	59	14				Drainage	1 day	Necropsy not done
18	Chinese	F	9	1	Yes	Yes		Appendicectomy	1 day	Haemorrhage mesoappendix

cases of perforated appendices after appendectomy and drainage stayed ten days. The cases with drainage of appendix abscess stayed on the average eight days. This apparent hurry to discharge our patient is because of the very quick turnover in the Unit required to cope with other emergency or non-emergency cases.

#### MORTALITY

There were eighteen immediate post-operative deaths in this series and Table IV shows the condition they were in when admitted and the treatment instituted.

TABLE IV

	Appendectomy alone	Appendectomy & drainage	Drainage
Acute appendicitis	3	—	—
Perforated with peritonitis	—	6	6
Appendix abscess	—	—	3

Table V goes into more details of those patients who died.

The mortality rate in four thousand and seventy-six cases of acute appendicitis was three deaths, i.e. 0.07%. One of the deaths was due to the slipping of the ligature around the meso-appendix and the other was from bleeding from the meso-appendix, the gridiron incision and the re-exploration incision (right lower paramedian). The conclusion was that this second patient died from blood dyscrasia. The third death was from generalised peritonitis and paralytic ileus.

Cases of kinked appendices had their appendices removed with no mortality.

Of the one hundred and sixty-six appendix abscesses, sixty-six were drained and the mortality rate of this procedure was three deaths, i.e. 4.5%. In six cases of perforated appendices with generalised peritonitis considered too ill for more major procedure other than drainage, all died, i.e. a mortality rate of 100%. In the remaining four hundred and nineteen cases of perforated appendices with obvious peritonitis, the treatment was appendectomy and drainage and this carried a mortality of six deaths, i.e. 1.4%. There was no mortality among the ninety-three cases of gangrenous appendices. Thus the over-all mortality of the perforated type of appendicitis (seven

hundred and eighty-four cases) was fifteen deaths, i.e. 1.9%. The mortality rate arising from the surgical treatment of the five thousand and sixty-seven cases was eighteen deaths, i.e. 0.35%.

#### COMMENTS

As appendicitis is so much more common among the major surgical emergency conditions than any other surgical disease, our medical practitioners should become so aware of its commonest presentation of pain in the umbilical region that such a complaint in a child or an adult should immediately suggest the diagnosis of acute appendicitis. The sooner the diagnosis is made the quicker will surgery bring relief and cure to the patient. There is no doubt at all from this study that once an appendix perforates, surgical treatment carries a higher mortality than in a non-perforated but diseased appendix. Of the eighteen deaths after surgical treatment, fifteen had perforated appendicitis with either localised or obvious peritonitis and the average delay in these cases was four days before surgery was sought. It is obvious too, in this study that early surgery carries a lower mortality. Appendectomy in acute appendicitis is now a relatively safe procedure in spite of being performed mainly by house surgeons and surgical trainees in a surgical unit. It is also true, however, that, although appendectomy is now a common place procedure in the surgical armamentarium, some respect must be paid to the apparently insignificant appendicular artery especially by surgical trainees and house surgeons, and care must be exercised in the ligature of this tiny but dangerous vessel so as to prevent any accidental slipping of the ligature.

#### SUMMARY

1. Five thousand and sixty-seven cases of appendicitis are studied in relation to racial incidence, sex, age groups and condition of the appendix at operation.
2. The over-all mortality of surgery is 0.35%.
3. Perforated appendices carry a mortality rate of 1.9% with surgery.

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